

August 24, 1948.

Dr. Martin Kristensen,
State Serum Institute,
Copenhagen, Denmark .

Dear Dr. Kristensen,

Thank you for sending your separate: Mutative bacterial fermentation. I shall be pleased if this represents a regular exchange of our publications.

I am very much interested in the possibility of "shift" mutations, in which the capacity to ferment one sugar is accompanied by the loss on another, and vice-versa. I am not clear whether the xylose-dulcitol relationship, in *S. typhi* "2", is of this character. Do you have any examples in the coli or Salmonellas of such shifts which definitely affect the fermentative capacity? I have been studying fermentative mutations in *E. coli* K-12 in some detail, and have yet to find such a shift mutation. On the other hand, you will be interested to learn that the inability to ferment a given sugar, e.g. lactose, may be the result of mutations of any one of several genes, as can be tested with recombination. On the other hand, a given Lac- mutation may be to either a stable or a more or less mutable negative allele, as work that my wife is doing illustrates. In addition, some single-gene mutations have been found which affect the fermentation of several substrates (glucose-lactose-maltose; or gluconate-lactose-maltose), and some have the peculiarity of temperature-sensitivity, i.e. fermentation of some sugars at 30° and not at 37° or higher.

I am enclosing a culture of *S. typhimurium*, S-21, (monophasic: 2d phase) which may be of some interest to you. As received it was xylose-negative; by selection on xylose-synthetic medium, and on xylose-FEB, X₁/ papillae have been noted, but I have been unable to obtain a pure X₁/ culture from it. If you should be led to study it, please

~~xxx~~ let me know what you find,

My best regards to Dr. Kauffmann,

Yours sincerely,

Joshua Lederberg,
Assistant Professor of Genetics.